

Elk River Bridge
(State Bridge 3093)
Spanning Elk River at Main Street
City of Elk Creek
Sherburne County
Minnesota

HAER No. MN-54

HAER
MINN
71-ELKR,
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Rocky Mountain Regional Office
U.S. Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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(State Bridge 3093)

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Location: Spanning Elk River at Main Street
City of Elk River, Sherburne County, Minnesota

UTM: 15:454050:5016660
Quad: Elk River, Minnesota (7.5 minute series)

Date of Construction: 1920

Designer: Minnesota Highway Commission

Builder: William S. Hewett of Minneapolis

Present Owner: City of Elk River

Present Use: Vehicular and pedestrian highway bridge

Significance: The Elk River Bridge was the first major reinforced-concrete bridge erected in Sherburne County. The structure is an excellent, early example of state-sponsored, standard-plan, highway bridge design in Minnesota.

Historian: Jeffrey A. Hess

April 1992

Bridge Description

Spanning the Elk River about one mile east of its confluence with the Mississippi River, the Elk River Bridge stands just northwest of the central business district of the City of Elk River. Oriented on a north-south longitudinal axis, the bridge provides a crossing for Sherburne County Road 30, known locally as Main Street. Although this section of the river was once an important waterpowered manufacturing district, the neighborhood now is residential. The only visible signs of the industrial past are a low, overflow concrete dam immediately upstream from the bridge and a small foundation slab of a demolished hydroelectric plant on the bridge's northwest end.

In terms of basic engineering, the Elk River Bridge is a simple, six-span, poured-in-place, reinforced-concrete structure, measuring 289 feet in length and 27.5 feet in width. All spans are supported by concrete bents on wood piling. On the upstream side, the river piers display pointed cutwaters protected by steel plate. The two end spans, designed to serve as abutments for the four river spans, are slab structures, stiffened underneath by shallow, integral transverse girders and brief curtain walls. The north abutment is 30 feet in length; the south abutment, 35 feet. The four river spans are deck-girder structures, consisting of an eight-inch-thick slab with four integral longitudinal girders, 19 inches wide and 40 inches deep. The two outer river spans are 56.5 feet in length; the two inner spans, 58 feet. Throughout the bridge, the concrete is reinforced by a conventional, unpatented arrangement of straight, hooked, and bent steel rods.

The bridge deck carries a paved, two-lane roadway with a cement sidewalk on the west side. The deck also carries reinforced-concrete railings on each side. Over the river spans, the railings display elliptical voids and pilasters to give the impression of a Classical Revival balustrade. Over the abutments, the railings form solid parapets articulated by pilasters and depressed panels. A municipal water pipe is suspended by metal straps from the bottom of the railing on the west side of the bridge. Spalling concrete is evident on both railings, as well as on the bridge's girders and piers.

History and Significance

Constructed over the Elk River in the City of Elk River in 1920, the six-span, deck-girder Elk River Bridge¹ was the first major reinforced-concrete bridge erected in Sherburne County. From a statewide perspective, the bridge was somewhat less unique. By 1920, Minnesota had at least 120 reinforced-concrete bridges incorporating essentially the same deck-girder design. All these structures derived from a set of standardized bridge plans that had been prepared by the Minnesota Highway Commission to ensure a uniform level of sound engineering throughout the state.² For proponents of the Minnesota good roads movement, the virtue of the Elk River Bridge was precisely its lack of individuality. Its standard-plan design was a guarantee of quality and safety, as well as a vindication of a 20-year political struggle to achieve state control of highway bridge engineering.

Despite its location at the confluence of the Elk and Mississippi rivers, the Elk River community from the very outset was more dependent on overland trade and travel than on river-born commerce. The first Euro-American settler, Pierre Bottineau, was drawn to the area because of its proximity to the Metropolitan Trail, a major fur-trade route linking Canadian agricultural settlements to the northwest with St. Paul to the southeast. In 1848, Bottineau built a trading post slightly west of the Elk River, and two years later, he opened the Elk River House, "a small tavern with limited conveniences." Bottineau no doubt was delighted when the federal government in 1851

¹ According to metal plates on bridge railings at the northwest and southeast ends, the bridge was officially named Bridge 3093 by the Minnesota Highway Commission in 1919. Another railing plate at the southeast corner indicates that the structure was renamed the Foley Memorial Bridge in 1981, in honor of Sherburne County Deputy Sheriff Edward Henry Foley, who lost his life in the line of duty near the bridge site in 1919. Neither of these names appears to be in common use. Most people seem to identify the structure as the Elk River Bridge. For example: "... we have inspected the substructure portion of the Elk River Bridge ..."; Gerald M. Sunde to Russell L. Matchinsky, August 1, 1972, in Elk River Department of Public Works.

² Basic data on MHC-designed bridges is found in a loose-leaf "bridge log" in the administrative offices of the Minnesota Department of Transportation, St. Paul. As early as 1913, the MHC had designed a 60-foot, reinforced-concrete, deck-girder span, which slightly exceeded the longest span in the Elk River Bridge. The Elk River Bridge was unusual, however, in having a relatively large number (4) of long spans. It appears to have been the longest concrete deck-girder bridge designed by the state prior to 1920.

adopted much of the Metropolitan Trail as an official military road, turning the well-trodden dirt track near his inn into an even more heavily traveled ditched-and-graded highway.³

Neither the Metropolitan Trail nor the military road crossed the Elk River at the site of the future Elk River Bridge. The trail crossed slightly to the southeast, and the road slightly to the northwest. Nevertheless, the bridge site does appear to have been an early crossing place: an 1868 map of Elk River identifies the road (now Main Street) leading to the site as "Bridge Street."⁴ The first documented bridge at the location was constructed by Sherburne County in 1884. It was a two-span, metal truss erected by the Wrought Iron Bridge Company of Canton, Ohio for the considerable sum of \$6,000. The expense apparently was justified by the fact that the immediate area had developed into a successful waterpower district. Containing a flour mill on the north bank and a sawmill and planing mill on the south bank, this manufacturing district remained in operation until the early twentieth century, giving the city's trade-center economy a healthy diversity that allowed the population to grow steadily from 537 residents in 1870, to 679 in 1890, to 859 in 1910.⁵

In terms of economic stability, Elk River also benefitted from excellent rail connections, first secured when the town became a stop on the St. Paul, Minneapolis and Manitoba (later Great

³ On Bottineau, see N. H. Winchell and others, History of the Upper Mississippi Valley (Minneapolis: Minnesota Historical Society, 1881), 296. The Metropolitan Trail and military road are discussed in Rhoda R. Gilman and others, The Red River Trails (St. Paul: Minnesota Historical Society, 1979), 81-82; Grover Singley, Tracing Minnesota's Old Government Roads (St. Paul: Minnesota Historical Society, 1974), 25-26, 30.

⁴ O. E. Garrison, "Plan of the Village of Elk River," unpublished, 1868, in Sherburne County Recorder's Office, Sherburne County Courthouse, Elk River.

⁵ On the metal truss bridge, see Cynthia Seelhammer and Mary Jo Mosher, The Growth of Sherburne County, 1875-1975 (Becker, MN: Sherburne County Historical Society, n.d.), 55. The structure is described as an "Iron Bridge 250' long" in [Map of] Elk River, Minn. July 1894, (New York: Sanborn-Perris Map Company), Sheet 3, in Library of Congress Microfilm Collection of Minnesota Insurance Maps, Reel 4. The same reel also has insurance maps of Elk River for December 1899, January 1905, September 1911, and September 1915. On these maps, the waterpower district appears to be in operation during all dates except the last, when all mill buildings disappear from the site. Originally, the waterpower district was part of a separate village, known as Orono, located immediately west of the original plat of Elk River, filed in 1868. The two communities officially merged when the City of Elk River was incorporated in 1881; see Winchell, 297. Population statistics in the text are from the published reports of the ninth, twelfth, and fourteenth federal censuses.

Northern) line in 1867.⁶ The state's railroad development, however, was a mixed blessing for rural trade centers like Elk River. As historian Arthur J. Larsen has pointed out, the steady improvement of rail service in Minnesota during the last quarter of the nineteenth century was accompanied by a corresponding decline in the quality of rural roads. Having secured efficient rail transportation between most population centers, politicians and taxpayers alike lost interest in local wagon roads.⁷ Although good rail connections made it easy for merchants to stock their stores with goods, bad roads made it difficult for farmers to go to town to buy them. It is therefore not surprising that country merchants were among the earliest critics of rural roads. By the 1890s, however, many other voices had joined the chorus: bankers, newspaper editors, engineers, bicycle enthusiasts, farmers with heavy traction engines, and even railroad owners, who believed that improved roads would funnel more business their way, "especially in country regions where it was unprofitable to build branch lines for a limited volume of local traffic."⁸

In 1893, over 350 advocates for highway reform assembled in St. Paul for Minnesota's first statewide good roads convention. After listening to two days of speeches and debates on progressive methods in highway construction and administration, the delegates formally established themselves as the Minnesota Good Roads Association, appointed an executive committee to formulate a legislative program, and returned home "to arouse a feeling for better roads in our districts." Since it seemed clear that better highways required better public funding, the newly formed Minnesota association devoted considerable energy towards overturning an amendment to the state constitution that severely restricted state expenditures for internal

⁶ Winchell, 296.

⁷ Arthur J. Larsen, The Development of the Minnesota Road System (St. Paul: Minnesota Historical Society, 1966), 175.

⁸ John B. Rac, The Road and the Car in American Life (Cambridge: MIT Press, 1971), 30-31; see also Larsen's chapter, "The Crusade for Better Roads," 330-378. Unless otherwise noted, the discussion of the Minnesota good roads movement is based on this section of Larsen's study.

improvements. In 1898 Minnesota voters repealed the objectionable provision, and approved a new amendment permitting a general levy for a State Road and Bridge Fund.

Since bridge building traditionally was the most expensive item in rural road improvements, township boards and county commissioners were eager to use the newly available state funds to upgrade river crossings in their jurisdictions. Good-roads advocates feared that these projects would be awarded in the customary manner, whereby bridge-building companies submitted bids based on their own engineering plans and untrained local officials attempted to select the best design for the money. Critics insisted that the system encouraged waste and incompetence, if not outright graft and fraud:

Since there is no uniformity in the plans there is no real basis for comparison of the bids. . . . The officials, having at best very little knowledge regarding the plans, then usually go into a room by themselves and call in the contractors' agents one by one to have them "explain" their plans. [Each] tries to convince them that his particular plan is the happy combination of price with value. . . . The result of these "explanations" is generally to confuse rather than to explain and to leave the officers less able to render good judgment than before hearing them.⁹

In 1905, the Minnesota state legislature took the first step towards placing bridge construction under state control. In that year, it created the Minnesota Highway Commission (MHC) to advise local governments concerning highway construction and to approve the design of projects constructed with state funds. The MHC was particularly interested in changing "the peculiar method of contracting for bridges without the advice or assistance of a bridge engineer well posted in such matters, and allowing such bridges to be built without any supervision." To this end, it began preparing standardized bridge and culvert plans for county and township use.¹⁰

⁹ Hans Nelson Brue, "The Development of Highway Bridges in Wisconsin," unpublished civil engineering thesis, University of Wisconsin, 1916, 6, in State Historical Society of Wisconsin Library, Madison, Wisconsin. Although Brue is criticizing Wisconsin practices, the system was the same in Minnesota.

¹⁰ The quotation is from Second Annual Report of the State Highway Commission of Minnesota, 1908 (Minneapolis: Pedersen Linotyping Co. Print, n.d.), 62. On the expense of building and maintaining rural bridges, see Larsen, 407. For an excellent discussion of the early duties and activities of the commission, see Robert M. Frame III, "Historic Bridge Project: A Report," 22-23, in Jeffrey A. Hess, "Final Report of the Minnesota Historic Bridge Survey: Part 1," unpublished report prepared for Minnesota Historical Society and Minnesota Department of Transportation, August 1988.

Since most highway construction was not subsidized by state aid, the MHC's influence was largely restricted to those local governments that voluntarily sought its counsel. Among highway reformers, Sherburne County had an especially good reputation. In this county, the good roads movement was spearheaded by county board chairman Charles M. Babcock. After studying engineering at the University of Minnesota in the mid 1890s, Babcock returned to his home town of Elk River to work in the family mercantile business. He soon found himself pondering "the effect of mired roads in the spring, and snow drifts in the winter that kept the farmers from getting into town." With the backing of fellow merchants, Babcock successfully campaigned as a good roads candidate for a seat on the Sherburne County Board. One of his first acts was to forge a cooperative farmer-townspeople agreement to keep the area's roads open year round. His continued advocacy for good roads, both as a county politician and private speaker, earned Babcock a gubernatorial appointment to the MHC in 1910. A year later, he became the agency's chairman.¹¹

Despite various institutional reorganizations of the MHC, Babcock was to remain chief administrator of the state highway program until the early 1930s. He is perhaps best known as the author of the "Babcock Plan," which during the 1920s created a state-owned network of well-engineered, all-weather trunk highways throughout Minnesota. His early years with the MHC were equally significant, for he presided over the agency when it first gained control of highway bridge design in the state. In 1913, the Minnesota legislature passed an omnibus highway bill that broke the power of bridge-building companies in the state and forced all but the largest metropolitan areas to rely on MHC design. For all bridge contracts exceeding \$500, the legislation required local governments to place on file a set of bridge plans for bidder inspection. It also required the MHC to furnish the necessary plans upon request. Since few local governments had the inclination

¹¹ The quotation is from "C.M. Babcock, 65, 'Father' of the State's Road System, Dies," Minnesota Tribune, November 24, 1936. See also Larsen, 439.

or resources to do their own bridge engineering, most turned to the MHC, which braced for the onslaught by preparing a set of 84 standardized bridge plans covering spans from 10 to 190 feet in length. Within three years, the agency had furnished plans for almost 1,200 bridges.¹²

Although World War I interrupted road and bridge construction throughout the nation, the Armistice refocused public attention on domestic issues, and highway projects surged in 1919. This upturn resulted partly from the resumption of previously postponed projects, and partly from recent Congressional legislation that made large-scale federal funding available for state highway improvements. In Minnesota, the MHC intended to use part of its federal funds to transform the largely unpaved State Road 1 into a concrete highway. The project held special meaning for Highway Commissioner Babcock, for the new road ran through his native Sherburne County, linking Elk River to Minneapolis on the south and St. Cloud on the north. In addition, the project received statewide publicity because the new concrete highway was to be included in the so-called "Jefferson Highway," one of several cross-country routes being promoted at the time by private tourist interests and automobile associations in order to encourage automotive travel. According to MHC plans, the concrete highway would enter the City of Elk River from the east on Depot Street, turn onto Main Street, and then cross the Elk River at Bridge Street. This route required replacement of the 1884 metal-truss bridge, which did not meet state and federal standards for width and load-bearing capability. Replacement costs were to be shared by the federal, state, and county governments on 50-25-25 basis.¹³

¹² On the Babcock plan, see Larsen, 447-468. A review of the 1913 Road Law, as it related to bridges, is found in Report of the State Highway Commission of Minnesota for 1914 (n. p., 1915), 222-223. For the number of state-designed bridges, compare the figures in the 1914 report (p. 225) with those on an unpaginated bridge map included in Report of the State Highway Commission of Minnesota, 1915-1916 (n. p., 1917).

¹³ Federal funding became available as a result of the federal Highway Act of 1916; see Larsen, 437-438. The new road's route through Elk River is stipulated in Sherburne County Commissioners Record, June 5, 1919, in Sherburne County Auditor's Office, Sherburne County Courthouse. On the planning and construction of the Jefferson Highway, see Larsen, 432-436; Hugh H. Shepard, "Jefferson Highway Association," Annals of Iowa 126 (October 1928): 432-447. The funding arrangement for the Elk River Bridge is noted in Seelhammer and Mosher, 329.

Although the MHC had standard plans for both steel and reinforced-concrete spans, it favored concrete whenever feasible, on the grounds that "a properly built concrete bridge needs no maintenance and will outlast the life of a number of steel bridges." Following accepted engineering practice for concrete construction, the MHC recommended standard reinforced-concrete deck girders for spans of 30 to 60 feet. In the design of the Elk River Bridge, this translated into four deck-girder spans (56.5 feet, 58 feet, 56.5 feet, 58 feet) with concrete-slab abutments at each end. The four girder spans were based on the agency's standard, 55-foot, deck-girder design. While early MHC-designed concrete bridges showed a preference for solid railings, the railings of the Elk River Bridge were primarily of the "open," or balustrade type, apparently reflecting the agency's disenchantment with "the monotonous appearance afforded by the plain rail of concrete."¹⁴

As mandated by the state legislature, the design of state-road bridges was the responsibility of the MHC, but their construction and maintenance fell to the county. On June 23, 1919, with native-son Charles M. Babcock in attendance, the Sherburne County Board opened bids for construction of the Elk River Bridge according to the MHC design. In addition to building the new bridge, the project also entailed the demolition of the existing metal-truss structure and the erection of a temporary crossing. The award went to William S. Hewett of Minneapolis, who proposed to take down the old bridge for \$1,000, erect a temporary crossing for "cost plus 10%," and complete the new concrete bridge for \$43,500 by the end of 1919. Although Hewett was slightly more expensive than the lowest bidder in regard to the concrete bridge, the board apparently believed that the rest of his proposal more than made up the difference. In selecting

¹⁴ The discussion of the bridge's original design is based on microfilm-reader photocopies of eight sheets of drawings approved by the MHC for Bridge 3039 on June 13, 1919. These were furnished to the author by the Elk River Department of Public Works. Neither the city nor the state can locate original drawings. On the MHC's preference for reinforced-concrete, see Report 1915-1916, 25. For the agency's guidelines on concrete girders, see State Highway Department of Minnesota, General Provisions and Bridge and Culvert Specifications (n.p., 1918), n.p.; essentially the same specifications are found in George H. Herrold, "Reinforced Concrete Highway Bridges," Tenth Bulletin of the Minnesota Surveyors' and Engineers' Society (1912-1913): 81. For an early MHC example of the plain concrete railing, see the photograph of the deck-girder Bridge No. 1204 in Report, 1914, 223. The agency's revised thinking on railings is found in Report, 1920, 7-8.

Hewett as general contractor for the county's first major concrete bridge, the board secured the services of one of the most experienced concrete builders in the United States.¹⁵

Born in Maine in 1864, Hewett relocated to Minneapolis in 1887 to work in the bridge-building business of his uncle, Seth Maurice Hewett. In 1896, Hewett struck out on his own as William S. Hewett and Company. Over the next 25 years, he became one of the most successful bridge builders in the Upper Midwest, extending his business throughout Minnesota, the Dakotas, and Montana. Although never formally trained as an engineer, Hewett was a skilled bridge designer with a strong interest in technological innovation. While working for his uncle in 1894, he came across an engineering article on a method of concrete reinforcement developed in Europe by Austrian engineer Josef Melan. Adopting the new technique for a project near Rock Rapids, Iowa, he succeeded in building the first reinforced concrete-arch highway bridge in North America. After setting up his own company, he built other Melan arches for the Twin City Rapid Transit Company in Minneapolis and St. Paul. These structures marked the beginning of reinforced-concrete construction in the Twin Cities. Still later in his life, Hewett experimented with pre-stressed concrete and is recognized as a pioneer in that technology as well.¹⁶

On the Elk River Bridge, Hewett functioned strictly as a builder, following the design laid down by the MHC. The project, however, turned out to be anything but routine. Delayed by "unforeseen difficulties in excavating for abutments," Hewett fell further behind when he could not secure adequate labor and materials. In early December, he petitioned the county board to extend his contract until June 1, 1920. The board agreed, "provided that the said Wm S Hewett assume the cost and liability of maintaining the temporary bridge mentioned in said contract and the

¹⁵ Sherburne County Commissioners Record, June 23, 1919.

¹⁶ Frederic L. Quivik, "Montana's Minneapolis Bridge Builders," IA: The Journal of the Society for Industrial Archeology 10 (1984): 38-40, 45; William S. Mueser, "The Development of Reinforced Concrete Bridge Construction," Cornell Civil Engineer 33 (May 1925): 161-163; Maurice W. Hewett, "William Sherman Hewett," unpublished, n.d., 1-6, in Minnesota Historical Society Library; Carl W. Condit, American Building (Chicago: University of Chicago Press, 1982), 174-175; "Reinforced Concrete Arch Bridges, Como Park, St. Paul," Engineering Record 50 (December 3, 1904): 644-648.

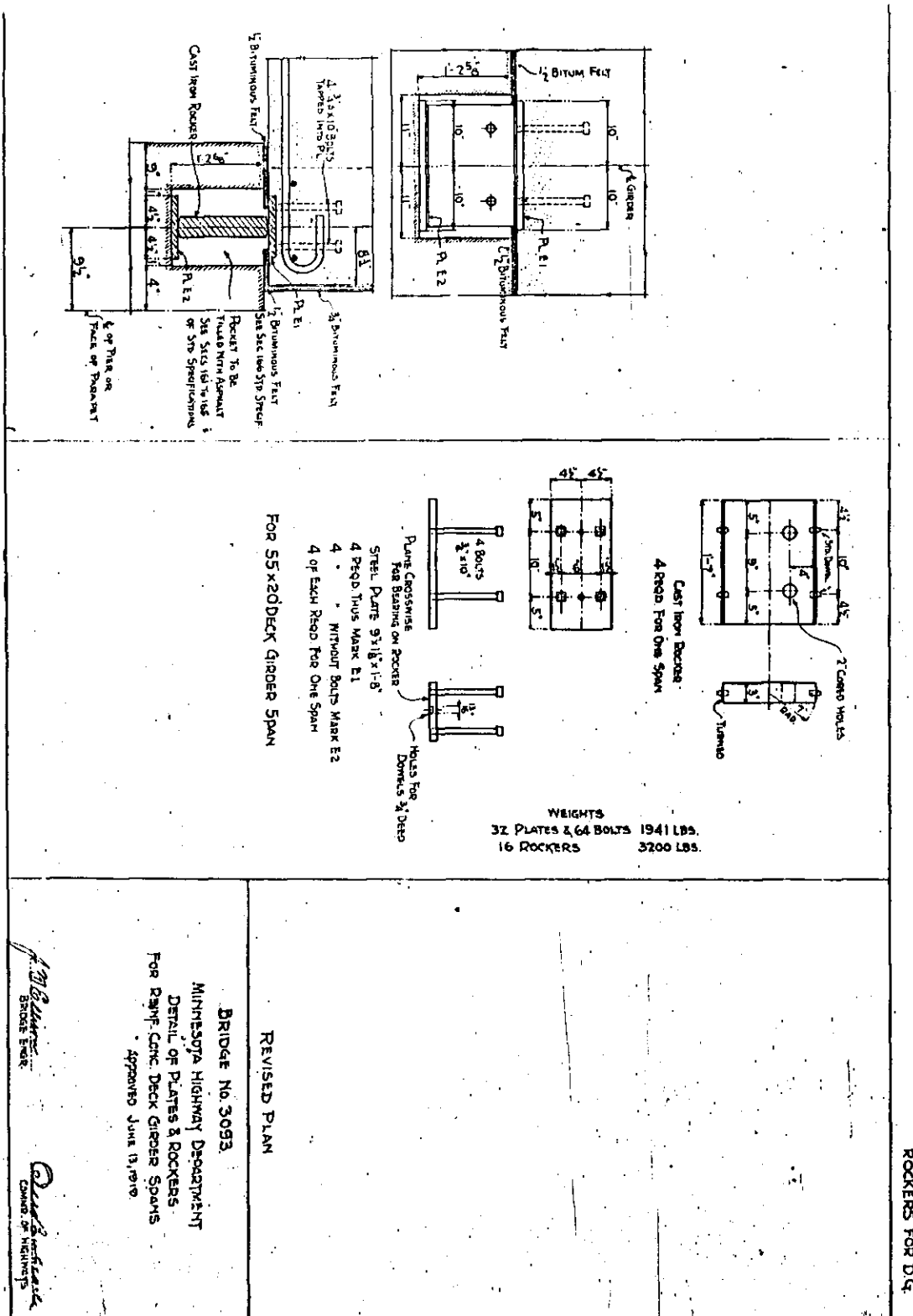
temporary roads leading thereto." During the last week in March, the Elk River flooded and nearly washed out the temporary crossing. Hewett was unable to complete the bridge until the middle of July. "It is said," reported the Sherburne County Star News, "the bridge contractor lost heavily on the project."¹⁷

In the 1920s, the Elk River Bridge was removed from county custody to become part of Minnesota Trunk Highway 3 and US Highway 10. It remained under state jurisdiction until 1948, when Highway 10 was re-routed to the north of Elk River. At that time, the state returned the bridge to Sherburne County, which gave it to the city in 1978. While under these various jurisdictions, the bridge experienced only minor modifications, such as the reinforcing of piers with steel plate in the 1930s and 1940s. In 1989, however, a thorough inspection of the bridge revealed extensive concrete deterioration that threatened the structure's load-bearing capacity. "It is our opinion," wrote the inspection team, "that the bridge should be removed and replaced." Since the bridge had been determined to be an historically significant structure, the City of Elk River agreed that, prior to demolition, it would document the structure according to standards established by the Historic American Engineering Record of the National Park Service. This study is intended to fulfill that obligation.¹⁸

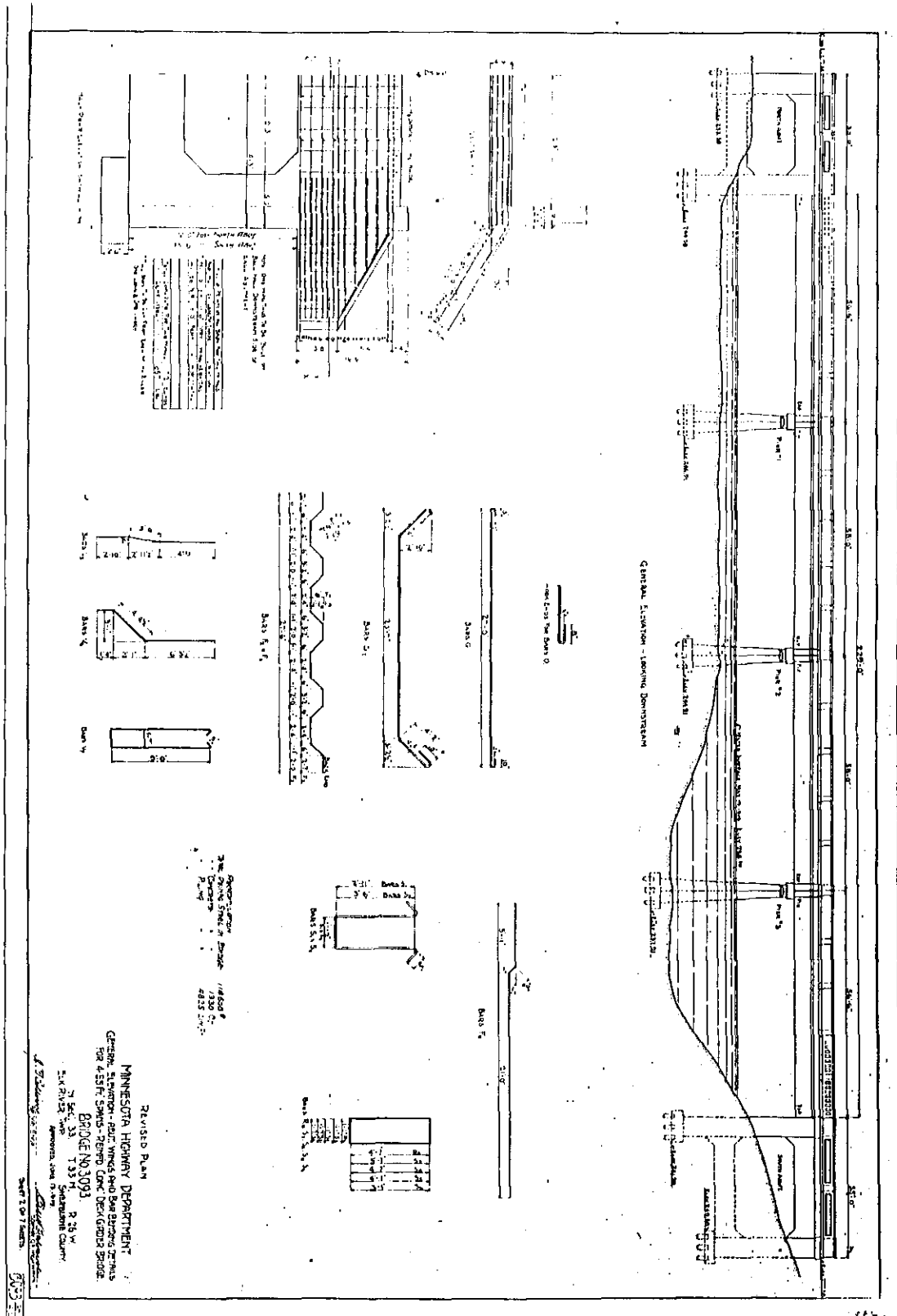
¹⁷ Sherburne County Commissioners Record, December 4, 1919; "Bridge Flooded by High Water," Sherburne County Star News, April 1, 1920; "Highway Open Next Sunday," News, July 22, 1920.

¹⁸ For early route designations, see Condition Map of Minnesota Trunk Highways (Minnesota Department of Highways, 1926). For changes in bridge ownership, see the following unpublished documents in the Elk River Department of Public Works: Notice of Release of Temporary Trunk Highway, State of Minnesota, Department of Highways, District 7, Number 44, January 26, 1948; Resolution Revoking a Portion of County State Aid Highway Number 12, April 4, 1978. The steel-plate repair is documented by microfilm-reader photocopies of two drawings, approved 1932 and revised 1946, in the Elk River Department of Public Works: "Details of Repairs to Piers No 1 and 3"; "Details of Protection Plates." For the engineering inspection, see Robert A. Curtis and John D. Pearson, "Structural Report, Bridge #3093," unpublished report prepared by Ericksen, Roed/Johnston-Sahlmann and Associates, Inc., 1989, n.p., in Referral File Number 88-0218, Minnesota Historical Society. See the same file for the following documents pertaining to the bridge's documentation: Joan M. DeGraff to Mark J. Graham, January 15, 1991; Advisory Council on Historic Preservation, Memorandum of Agreement, August 27, 1990.

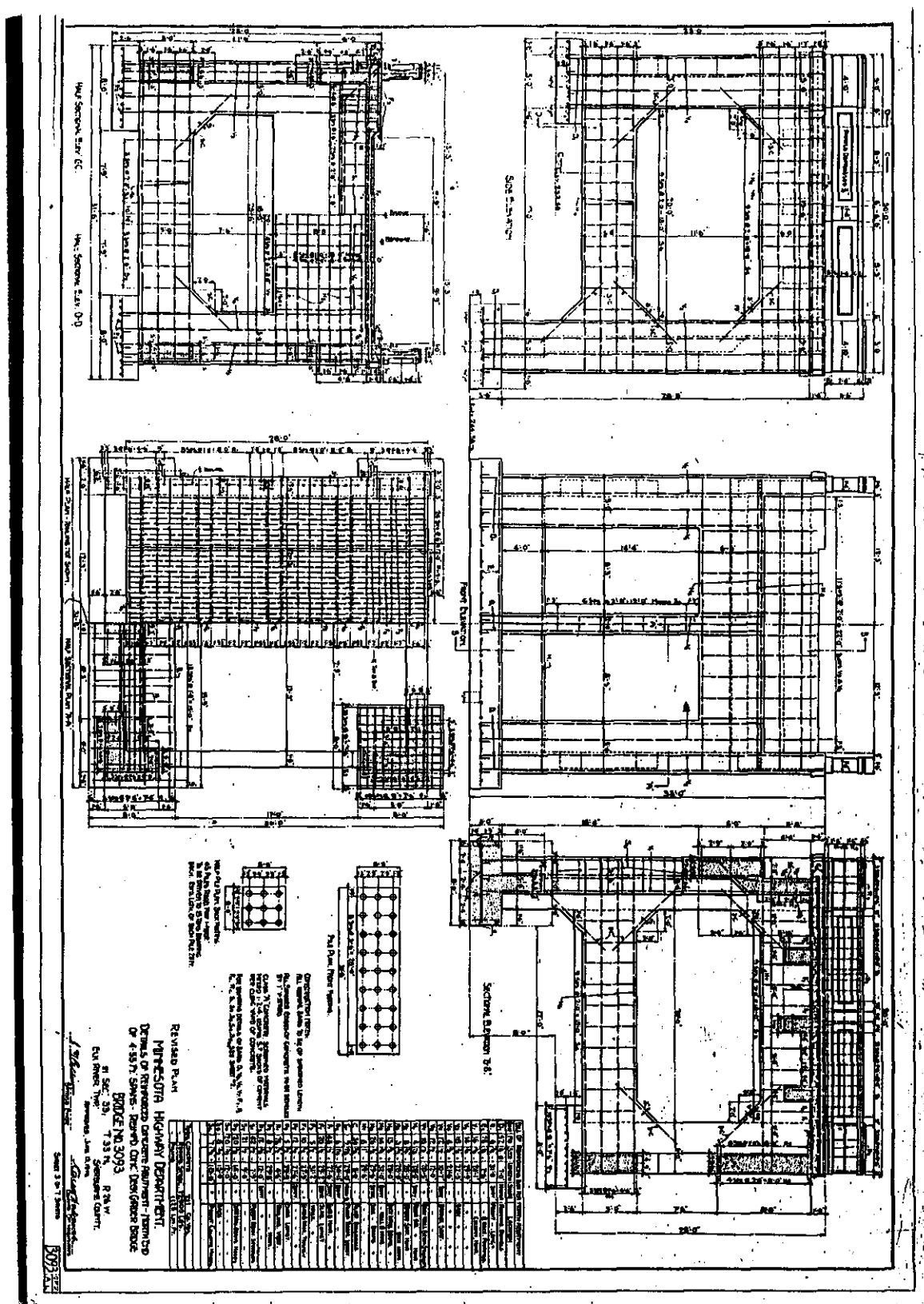
[Minnesota Highway Department. Bridge No. 3093, Detail of Plates and Rockers, June 13, 1919.
Photocopy of microfilm print.]

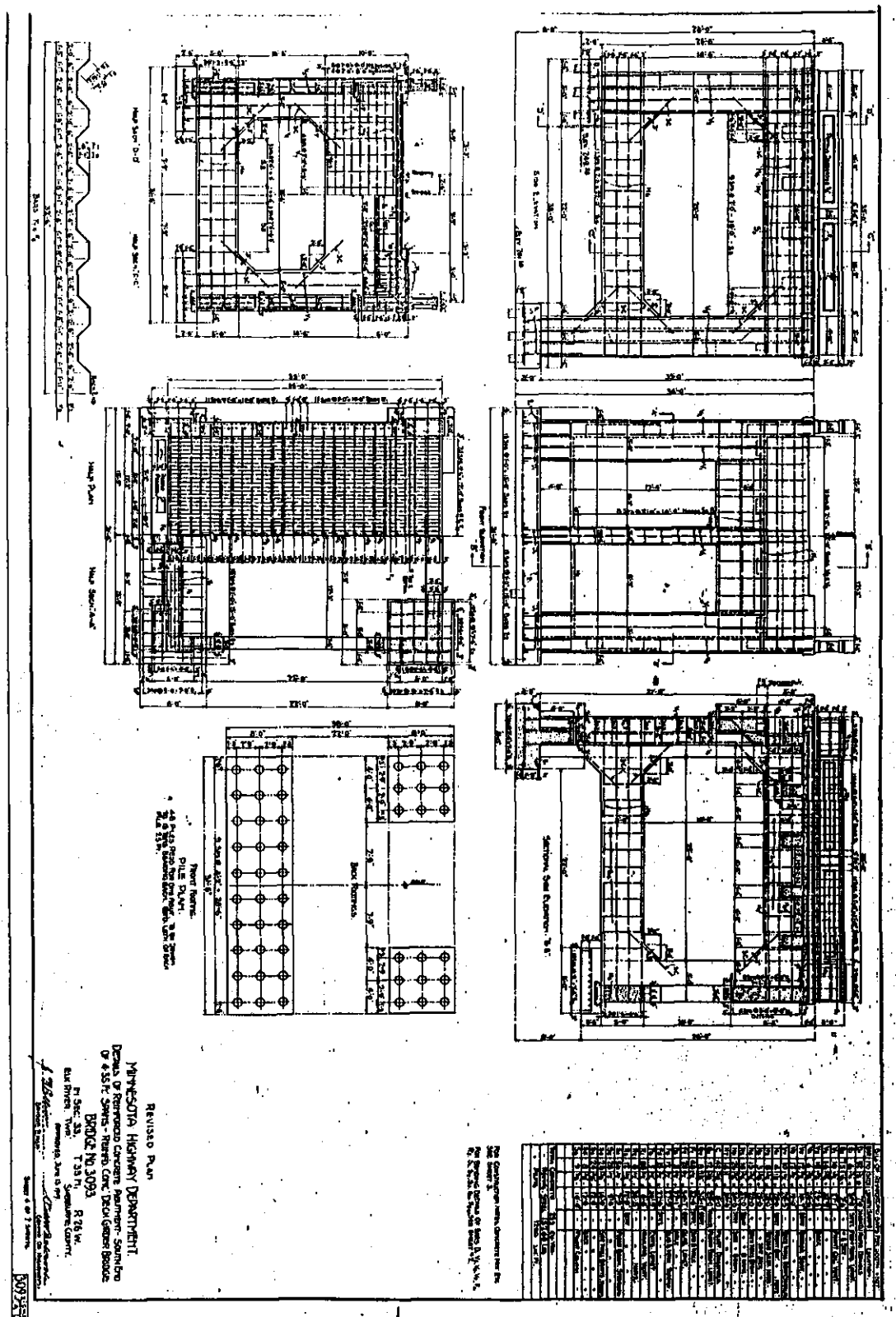


[Minnesota Highway Department. Bridge No. 3093, General Elevation, June 13, 1919. Photocopy of microfilm print.]

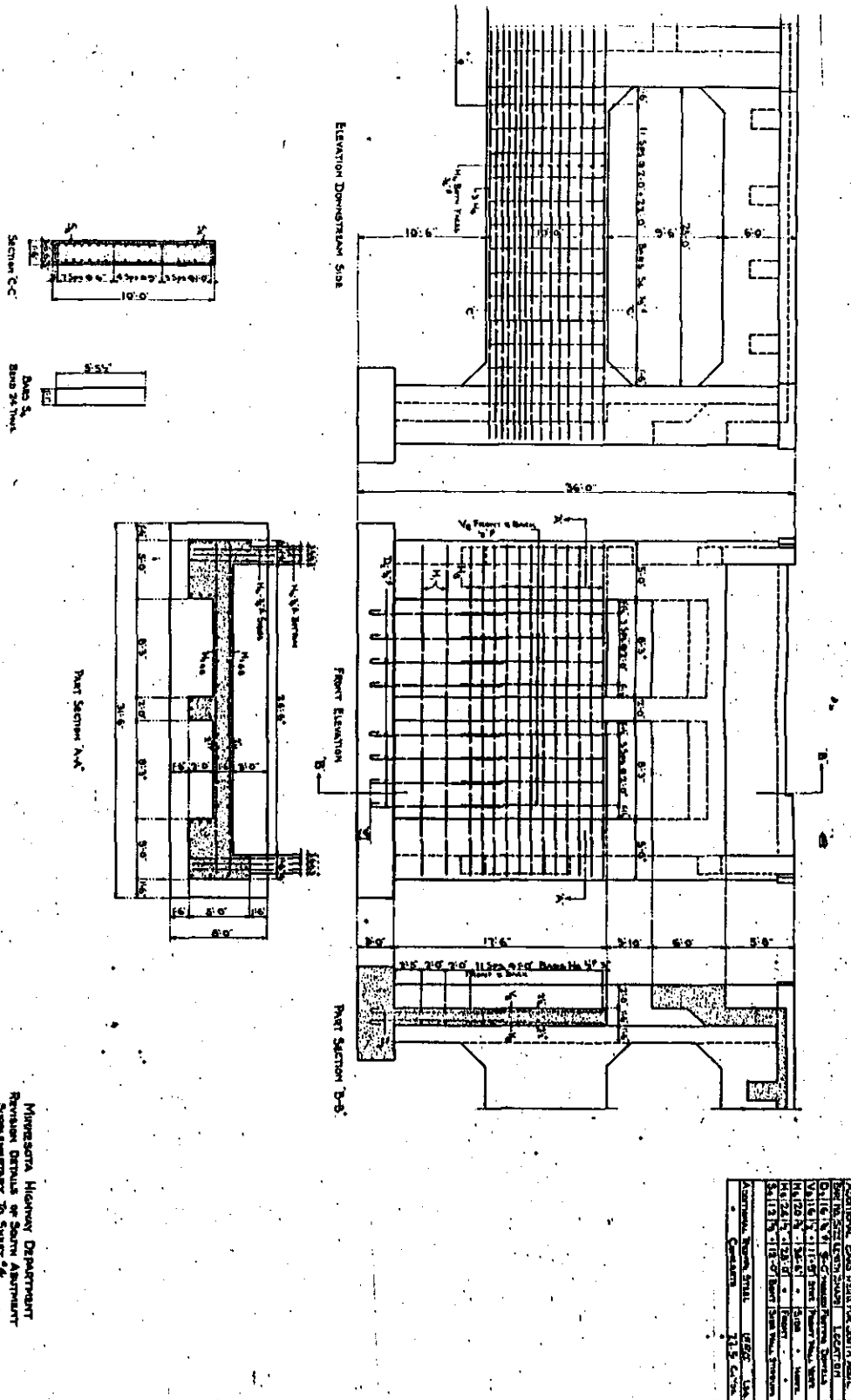


[Minnesota Highway Department. Bridge No. 3093, Details of Reinforced Concrete Abutment, North end, June 13, 1919. Photocopy of microfilm print.]



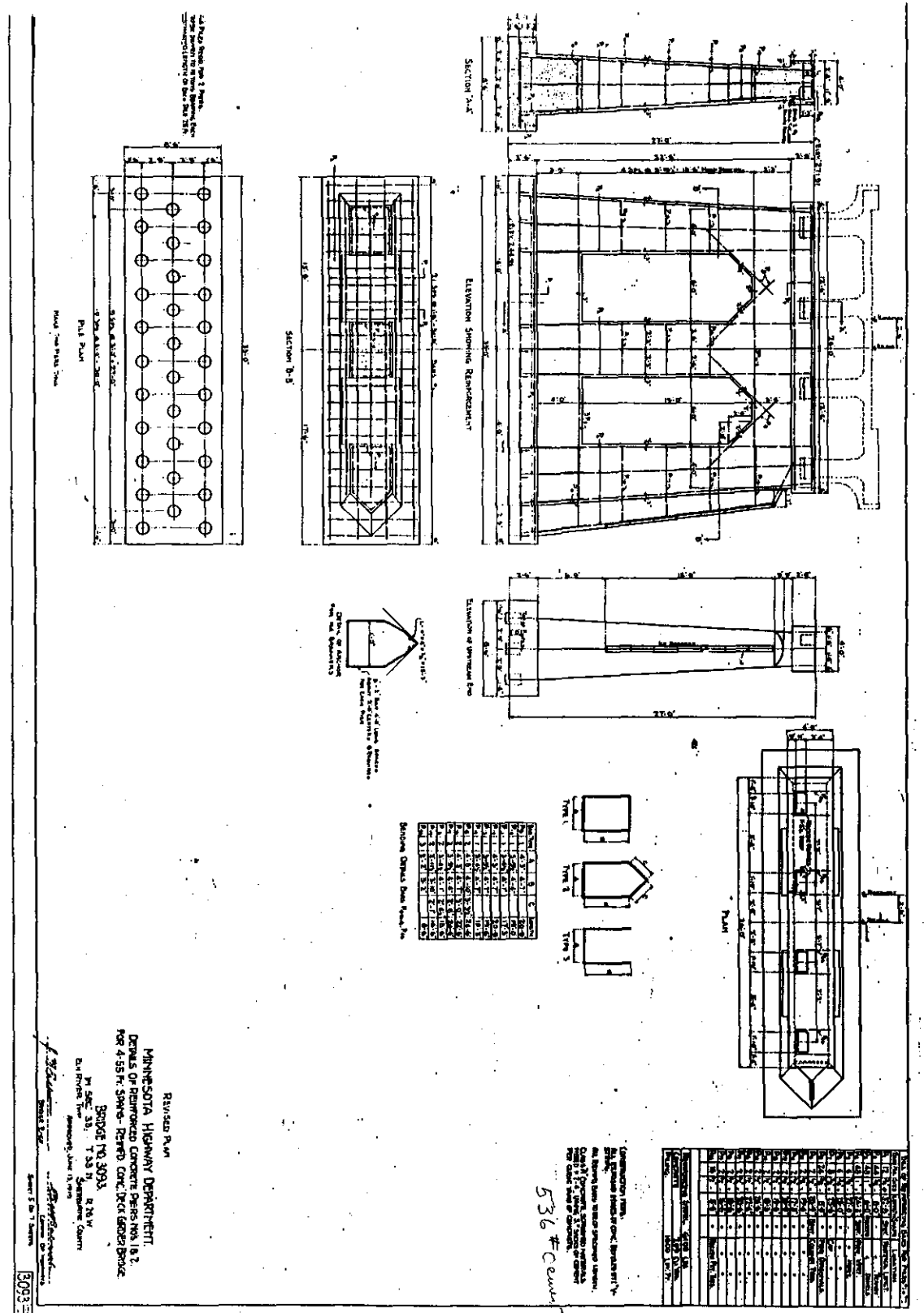


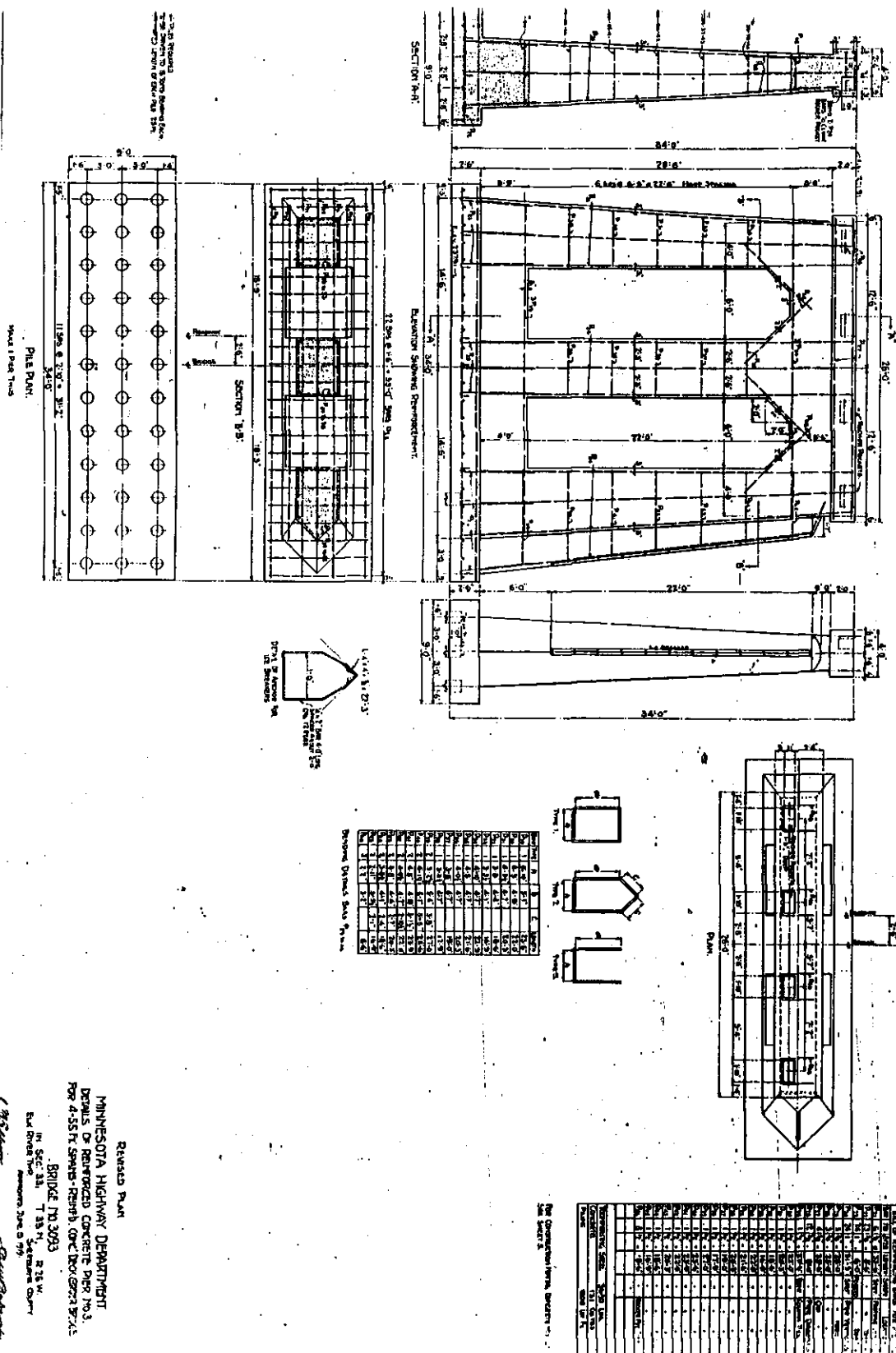
[Minnesota Highway Department. Bridge No. 3093, Revision Details of South Abutment, September 1919. Photocopy of microfilm print.]



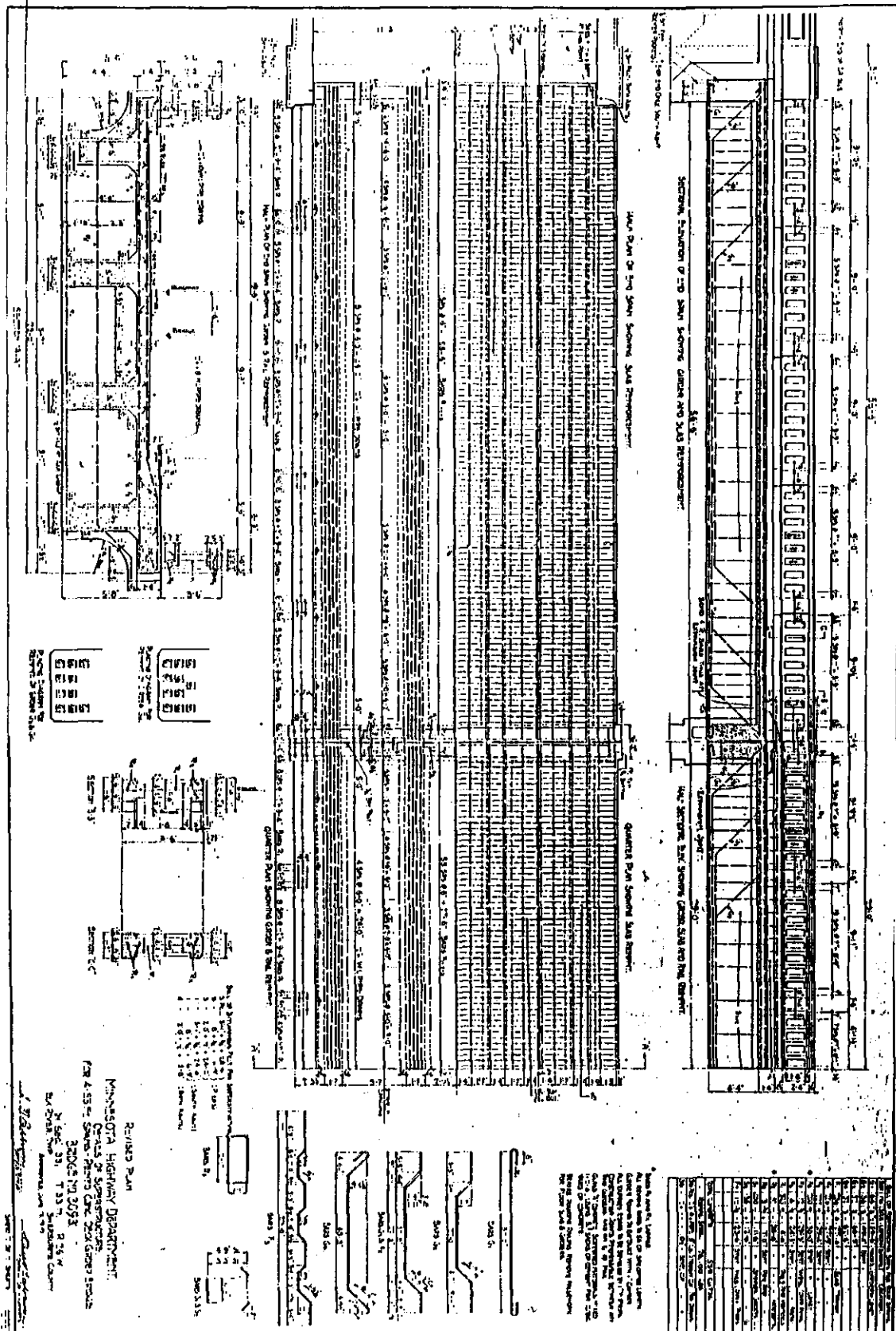
MINNESOTA HIGHWAY DEPARTMENT
REVISION DETAILS OF SOUTH ABUTMENT
SUPPLEMENTARY TO SHEET 14
BRIDGE NO. 3093
IN S.D. 133N. R.24W.
ST. LOUIS TWP. ANNEPESSE CO. MINN.
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[Minnesota Highway Department. Bridge No. 3093, Details of Reinforced Concrete Piers Nos. 1 & 2, June 13, 1919. Photocopy of microfilm print.]





[Minnesota Highway Department. Bridge No. 3093, Details of Superstructure, June 13, 1919.
Photocopy of microfilm print.]



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